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Acute-exposure to *Jatropha Gossypifolia* flower extract alters some biochemical indices in Albino Rats

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Abstract

This study was designed to evaluate the effects of *Jatropha gossypifolia* flower extract on some selected biochemical indices in albino rats. Experimental design involves twenty (20) rats which were divided into four groups of five animals each. Group I received distilled water (vehicle), group II, III and IV received (50, 100 and 200mg/kg bwt) of the extract respectively for a period of 14-day. The rats were anaesthetized 24hrs after the last administration and sacrificed accordingly. Animal serum was collected for the determination of biochemical indices as well as assessment of the probable effect on the rat hematological parameters. Results obtained from biochemical assay indicated a significant ($P<0.05$) decrease in activity of serum aspartate amino transferase (AST), alanine amino transferase (ALT), alkaline phosphatase (ALP) and bilirubin in rats treated with *Jatropha gossypifolia* flower extract in vivo when compared with the control. However, appreciable increase in levels of total protein and albumin was observed in *Jatropha gossypifolia* flower extract treated rats when compared with the control. The results of this investigation also revealed a significant ($P<0.05$) concentration-dependent increase in hematological parameters of the *Jatropha gossypifolia* flower extract treated rats when compared with the control. Hence, it could be inferred from the results that *Jatropha gossypifolia* flower extract could enhance positive modulatory effects on serum biochemical indices as well as hematological status of albino rats.

Keywords: *Jatropha gossypifolia*; Biochemical indices; Hematological status; Acute-exposure

1. Introduction

Herbal medicine has generated a considerable lot of interest worldwide for its contribution to the overall health care delivery (Ahmed and Hussain, 2013). This is predicated on the fact that estimated 80% of the population in developing countries depend on natural products or herbal medicine (Bodekar and Wilcox, 2000) and also natural products and their derivatives represent almost half of the drugs approved since 1994 (Harvey, 2008). Expectedly in Africa and Nigeria in particular, the increasing cost of these drugs has decreased its accessibility to poor communities who cannot afford them. Treatment of illness and maintenance of health/well-being using herbal medicines is the oldest and most popular form of healthcare practice known to humanity that has been practiced by all cultures in all ages throughout the history of civilization.

Jatropha gossypiifolia, commonly known as bellyache bush, black physicnut or cotton-leaf physicnut, is a species of flowering plant in the spurge family, Euphorbiaceae (Grin, 2011). The species is native to Mexico, Philippines, South America, Gujarat State (India) and the Caribbean islands. The increasing health challenges coupled with unavailability and inaccessibility of orthodox medicine have triggered tremendous awareness and acceptability of herbal medicine such as *Jatropha gossypiifolia* by rural communities without recourse to its effects on the human health. Therefore, this

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study is carried out to investigate the likely effects of ethanolic flower extract of *Jatropha gossypiifolia* on some liver function indices and hematological parameters in albino rats.

2. Material and methods

2.1. Plant Materials

Samples of *Jatropha gossypiifolia* flowers were obtained from a private farm in Ado Ekiti, air dried in the laboratory, pulverized and then stored in an airtight container.

2.2. Reagents and Chemicals

All reagents and chemicals were all of analytical grade.

2.3. Extraction of the extract

Jatropha gossypiifolia flower was air-dried for 32 days at room temperature. The air-dried samples were ground to fine powder using a blender. 300 g of the powdered sample was soaked in 1500 ml of ethanol for 72 hours. It was then filtered using a cheese cloth, and freeze-dried to obtain the dried extract.

2.4. Experimental Design

20 male albino rats weighing 120 kg – 150 kg was obtained from the animal house at Federal Polytechnic, Ado-Ekiti. They were acclimatized in the animal house for 2 weeks, housed in clean wire meshed cages under standard conditions temperature (24 ± 1^{o}C), relative humidity, and $^{12}/_{12}$-hour light and dark cycle. They were allowed to have free access to food (commercial palletized diet from Vital Feed Mill) and drinking water *ad libitum* daily. The rat beddings were changed and replaced every day throughout the experimental period. The rats were divided into four groups of five animals each. Group I received distilled water (vehicle), group II, III and IV received (50, 100 and 200mg/kg bwt) of the extract respectively for a period of 14-day. The rats were anaesthetized 24hrs after the last administration and sacrificed accordingly. Animal serum was collected for the determination of biochemical indices and hematological assay.

2.5. Biochemical Assay

The biochemical indices were determined colorimetrically by employing the standard ready-to-use Randox kits. The parameters assayed include aspartate amino transferase (AST) and alanine amino transferase (ALT) described by (Rietman and Frankel, 1957), alkaline phosphatase (ALP) as described by (Englehardt et al., 1970) while total protein, albumin and bilirubin levels were determined as described by (Gornal et al., 1949).

2.6. Hematological assay

Red blood cell (RBC) count was done using the conventional method of (Dacie and Lewis, 2001). Blood was diluted to 1:200 with Hayem's fluid which preserved the corpuscles and then counted with a Neubauer counting chamber under a light microscope. The counting of total white blood cells was done with the method of Brown (1974) using a diluting fluid (Turk's fluid) in a ratio of 1:20. Differential white blood cell count was carried out using Leishman's stain. Conventional method using Sahli's haemoglobinometer was employed for estimation of hemoglobin (Hb) content of the blood while packed cell volume (PCV) was done using the microhematocrit method (Dacie and Lewis, 2001).

2.7. Calculation of absolute values

The different absolute values: mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were calculated from values of RBC, PCV and Hb as follows:

MCV (millimicron) = PCV% x 10 / RBC count (x million per mm^3); MCH (picogram) =Hb

G/dl x 10 / RBC count (x million per mm3) and MCHC (picogram) = Hb g/dl x 100 / PCV %

2.8. Statistical Analysis

All values are expressed as mean ± SD. Statistical evaluation was done using One Way Analysis of Variance (ANOVA) followed by Duncan's Multiple Range Test (DMRT) by using SPSS 11.09 for windows. The significance level was set at ($p < 0.05$).

3. Results

Table 1 Effects of *Jatropha gossypiifolia* flower extract on the activities of serum biomarkers of albino rats

Group	AST (U/I)	ALT (U/I)	ALP (mg/dl)	Bilirubin (mmol/l)	Total Protein (mg prot/ml serum)	Albumin (g/l)
Control	26.84±0.51^{a}	9.36±0.48^{a}	82.50±2.33^{a}	41.03±0.47^{a}	3.75 ± 0.20^{a}	33.4 ± 1.97^{a}
Extract (50 mg/kg)	26.00±0.24^{a}	7.40±0.28^{a}	74.25±1.81^{b}	32.11±1.04^{bc}	1.72 ±0.21^{a}	38.78±1.34^{b}
Extract (100 mg/kg)	25.22±0.30^{a}	7.10±0.23^{a}	70.62±1.81^{a}	28.72±0.83^{b}	1.67 ± 0.25^{a}	39.14±1.26^{a}
Extract (200 mg/kg)	24.11±0.27^{a}	6.87±0.16^{a}	68.64±2.76^{a}	24.85±1.28^{b}	1.56 ± 0.24^{a}	42.33±1.88^{a}

Values are expressed as mean ± standard deviation (n=5).

Table 2 Effects of Jatropha gossypiifolia flower extract on the hematological parameters of albino rats

Parameters/Groups	Control	*J. gossypifolia* (50mg/kg)	*J. gossypifolia* (100mg/kg)	*J. gossypifolia* (200mg/kg)
HAEMATOCRIT PCV (%)	28.00 ± 1.41^{a}	29.50 ± 2.12^{a}	44.00 ± 2.83^{bc}	48.50 ± 3.54^{b}
HAEMOGLOBIN (g/dL)	9.55 ± 0.64^{a}	14.65 ± 0.92^{b}	15.95 ± 1.77^{a}	16.25 ± 1.34^{a}
MCV (fL)	61.00 ± 1.41^{a}	55.50 ± 2.12^{b}	52.10 ± 3.82^{b}	50.05 ± 7.00^{a}
MCHC(g/dL)	20.90 ± 0.14^{a}	36.50 ± 2.12^{bc}	37.95 ± 16.19^{a}	37.95 ± 16.19^{a}
RBC COUNT X10^{6}/mm^{3}	5.30±0.57^{a}	8.50±1.29^{a}	9.10±0.28^{a}	9.80±2.12^{a}
WBC Count (X10^{3}/mm^{3})	9.30±0.57^{a}	10.20±0.71^{a}	11.95±0.21^{a}	13.10±0.28^{a}
Neutrophils %	24.00±7.07^{a}	32.50±4.95^{bc}	36.00±7.07^{b}	40.50±2.12^{b}
Lymphocytes %	57.00±1.41^{a}	58.50± 2.12^{a}	62.50±6.36^{b}	66.50±4.95^{b}
Monocytes %	1.00±0.00^{a}	1.00±0.00^{a}	1.50±0.71^{b}	1.50±0.71^{a}
Eosinophils %	0	0	0	0
Basophils %	0	0	0	0
Platelet X10^{3} /ml	137.50±48.79^{a}	146.50±51.61^{b}	247.00±8.49^{bc}	340.50±10.61^{bc}

Results are expressed as means ±SD (n=5)

4. Discussion

The significant ($P<0.05$) decrease in the serum AST, ALT, ALP and Bilirubin observed in the *Jatropha gossypiifolia* flower extract treated rats (Table 1) indicates hepatoprotective effects of the extract. Serum albumin and total protein are some of the markers of liver dysfunction while albumin transports bilirubin and other substances in blood (Vasudevan and Sreekumari, 2007). The significant increase in the level of albumin may indicate that the synthetic function of the liver has not been significantly affected and as well suggest that free albumin is elevated due to the decreased level of bilirubin in the test animals. The bilirubin formed from breakdown of red blood cells in the reticuloendothelial cells are transported in plasma bound to albumin (Vasudevan and Sreekumari, 2007), so the decrease in bilirubin level, as a result of reduction in the natural oxidative break down of red blood cells may account for the observed increase in albumin, as less albumin was bound in the treated rats. It therefore seems that the *Jatropha gossypiifolia* flower extract

might provide resistance to oxidative break down of red blood cells membranes and may be considered safe to the liver hepatocytes. Besides, the highly significant ($p<0.05$) red blood cells (RBC) count obtained in rats treated with *Jatropha gossypiifolia* flower extract indicates the capacity of *J. gossypifolia* flower extract to improve the RBC count, enhance physiological transport of oxygen and carbon dioxide and prevent anemia, perhaps via improved erythropoiesis or diminished RBC destruction in the rats. Increased RBC count suggests potential stimulation of erythropoietin release from the kidneys with a resultant increase in RBC synthesis or diminished destruction that could result to polycythemia and enhance oxygen-carrying/delivery capacity via the blood in the rats (Isaac *et al*., 2013). The white bllod cells (WBC) count in rats exposed to the various treatment groups of *Jatropha gossypiifolia* flower extract was significantly ($p<0.05$) increased compared to that of the control. This suggests that the extract has potential to improve the WBC count, and perhaps the overall immunity of the rats. The highest packed cell volume (PCV) value obtained at highest extract concentration in treated rats was significant ($P<0.05$) when compared with the control. This indicates that the *Jatropha gossypiifolia* flower extract has potential to improve PCV value of the rats. Increased PCV value usually transits to potential increase in RBC production or erythropoiesis resulting to polycythaemia (Holy *et al.,* 2015; Oyedeji and Bolarinwa, 2013) as noted in this study, decreased thrombotic events or cardiovascular mortality (Nwankwo and Egbuonu, 2017); higher protection on the integrity of erythrocytes by boosting their volume percentage in the blood (Nwankwo and Egbuonu, 2017), improved transport of oxygen and absorbed nutrients (Isaac *et al*., 2013; Etim *et al*., 2014).

5. Conclusion

The results obtained from this study indicated that Jatropha gossypifolia flower extract demonstrated non-toxic effect at tested doses and could positively enhance modulatory effects on biochemical and hematological parameters of albino rats.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest on this research work.

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